

Urban water

World's cities increasingly water insecure new study shows



With more than half of humanity now living in urban areas, the world's cities are facing unprecedented challenges in securing water supplies. This is according to a new report by the Nature Conservancy in partnership with the C40 Cities Climate Leadership Group and the International Water Association.

All cities, regardless of size, need a clean, consistent water supply to thrive, so it is little wonder that capital expenditures on water supply are large – US\$90-billion a year – and growing. Unfortunately, drinking sources are increasingly insecure.

According to the report, *Urban water footprint – Mapping conservation solutions to the global water challenge* – cities face twin challenges, namely water that is both scarce and polluted. “Rising demand has been allowed to grow unchecked, competing users upstream do not talk to or trust one another, increasingly unpredictable rainfall patterns have been altered by climate change; and the watersheds where our water comes from have been degraded,” the authors write in the report.

The report lays out a basic set of facts and ideas about the market potential

for conservation to improve the supply of water, in particular its quality (what is now commonly known as investing in ecological infrastructure). The findings provide an important basis for comparing engineered and natural solutions and exploring how the two can be integrated to provide a more robust system.

With urban demand on the rise and catchments and their water quality increasingly degraded, cities are looking farther and farther from their boundaries for water (think about Gauteng receiving its water from Lesotho, for example).

It is estimated that the hundred largest cities in the world currently transfer 3.2 million m³ of water a distance of 5 700 km every day in artificial channels. That means roughly 43% of water supply is obtained by interbasin transfer or moving one water from one river catchment to another.

According to the report, this is not sustainable in the long term. “[Moving more water over great distances to meet demand] may also not be climate adaptive – even when taking into account inter-basin transfers, one in four large cities are already facing water stress today – and it will likely to be unaffordable to many cities, especially those in developing countries.”

A different approach is possible: using the lands that source our waters more wisely. Investing in nature can change how land use in source catchments affects water quality and, over time, possibly water quantity.

Watersheds as natural infrastructure

To help determine where watershed conservation can help secure water for cities, the authors estimated the effectiveness of five common conservation strategies: land protection, reforestation, riparian restoration, agricultural best practices and forest fuel reduction. For each strategy, they evaluated how effectively it reduces sedimentation and nutrient pollution in more than 2 000 catchments that serve 500 cities.

The analysis finds that conservation strategies could measurably improve the quality of water sources serving over 700 million people living in the 100 largest cities. What’s more, at least one of the five conservation strategies could achieve a significant reduction in sediment or nutrient pollution in the vast majority of the world’s urban source catchments.

Water quality benefits can be achieved by targeting conservation on a small fraction of the area in source catchments. For example, implementing agricultural best practices on just 0.2% of the area where large cities get their water could reduce sediment pollution by 10%.

The findings suggest that the greatest potential to secure water for cities lies in improving the management of agricultural lands. This is especially true for sediment reduction, where over 600 million city dwellers would see a material improvement in the quality of their water sources if agricultural best management practices were applied in a targeted way to some 6.4 million ha.

Forest protection would benefit the second greatest number of people, about 430 million. However, to achieve the same impact on water quality as agricultural best management practices, this strategy would require conserving an area of land six times greater, some 41 million ha. The same trend is true of riparian restoration, suggesting that the additional benefits of forests, from recreation to carbon sequestration, would need to be monetised in order to fund source catchment conservation at a global scale.

Cape Town – Protecting land, reducing erosion

Cape Town is one of the cities featured in the report, *Urban water footprint – Mapping conservation solutions to the global water challenge*. Unlike many other cities, South Africa’s Mother City sits amid one of the most biologically diverse areas on Earth, namely the Cape Floristic Region, which means, much of the water-source catchments around it are formally protected.

This means that, unlike many cities, Cape Town does not need to invest heavily in buying and setting aside protected areas. It does, however, need to ensure that the water sources areas stay healthy.

One of the biggest threats are invasive plants, such as pine, acacia, eucalyptus and others. These alien invasive plants take up enormous volumes of water, reducing the flow into streams and reservoirs. The problem is most severe in the region around Cape Town, where invasive alien plants have reduced the annual runoff by nearly a third.

One solution that is described in the report is the *Working for Water programme* that addresses both poverty and water scarcity while maintaining the ecological integrity of the landscapes. The programme, which employs around 32 000 people, has been active since 1995. In partnership with this programme, the City of Cape Town controls invasive plants in the water source area of the Wemmershoek Dam, one of the city’s main dams as well as in the Peninsula watershed. The city also controls aquatic weeds on its various rivers to improve the health of the freshwater ecosystems.

Cape Town has relatively few options for increasing its water supply. Desalination plants and massive infrastructure projects to bring water from wetter areas of the country thousands of kilometres away are not economically viable and would take years, if they were possible at all.

The report concludes that the city will need to be more efficient in the way it uses water, and wise in the way it manages the catchments that provide it. In this case, removing thirsty alien tree species and restoring indigenous vegetation is critical to safeguard water services.

The authors admit that not all catchment conservation is equally cost-effective.

"The amount of land on which conservation activity would have to be conducted to achieve a measurable reduction in a pollutant varies widely among cities. Effectiveness is greatest for small source catchments, where action on a relatively small number of hectares can significantly change concentrations of pollutants."

Using information on reported water treatment plant operations and maintenance costs from a sample of cities, the report shows that reductions in sediment and nutrients lead to significant reductions in treatment plant operations and maintenance. A reduction in sediment and nutrients by 10% leads to a roughly 5% reduction in treatment costs. If all possible conservation strategies were applied, global water savings on treatment plant

operations and maintenance would be US\$890-million a year.

Source catchment conservation saves money for utilities in other ways as well. For instance, investing in conservation strategies is likely to reduce capital expenditures over time for utilities, as cities can continue using cheaper water treatment technologies rather than upgrading to more complex, expensive technologies. Catchment conservation also creates value to cities beyond water treatment, including recreation, economic development and biodiversity.

The report concludes by saying that cities are drivers of stewardship for hundreds of kilometres around them. "They shape the landscape, and in doing so end up defining a route of development for both themselves and their neighbours in rural areas. Water managers should extend their definition

of water infrastructure to include the entire river systems and watersheds that their cities depend on, and incorporate investment in those watersheds as part of their normal toolkit of securing water for people."

Securing adequate, clean water supply for cities is a global challenge that will require investment in both engineered and natural solutions. Cities that embrace both these approaches will not only meet future water demand; they will reshape the planet's landscape for the better.

To find out more, 'download the report at <http://water.nature.org/waterblueprint>



Table 1: Five conservation strategies to help secure water for cities

Strategy	Description
Forest production	Purchase of easements, land rental, fencing out cattle, and funding for park guards to maintain catchment services
Reforestation	Restoration of planning of indigenous trees, grasses and shrubs in critical areas to reduce erosion and related sediment transport
Agricultural best management practices	Implementation of cover crops, contour farming to prevent – and wetland and terrace construction to trap – sediment and nutrient runoff
Riparian restoration	River bank restoration and protection to reduce erosion and improve water quality
Forest fuel reduction	Conducting controlled burns and/or mechanical treatment to reduce wildfire severity and related sediment and ash pollution

